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MEGALONYX MILLERI, A NEW PLEISTOCENE GROUND SLOTH FROM SOUTHERN CALIFORNIA

BY

Gretchen M. Lyon
University of California at Los Angeles

Introduction

Southern California has contributed very little to the knowledge of *Megalonyx,* the extinct genus of ground sloth. The Pleistocene asphalt beds of Rancho La Brea in Los Angeles, covered by Stock's extensive monograph (1925), have offered a greater number of specimens than any other location in southern California, but have included no skulls in the collection. The particularly handsome, though incomplete, skull described here, therefore is of value and interest.

Thomas Jefferson first brought *Megalonyx* into public notice and named it generically in 1797 when he read a paper concerning parts of it found in Virginia. Not until 1822 did Desmarest name it specifically, *Megalonyx jeffersonii.* Finally in 1855 Joseph Leidy's memoir was published with full description and illustrations made from material assembled from various parts of southern North America. He had two almost complete skulls in addition to other parts of the skeleton. In publications concerning discoveries of *Megalonyx jeffersonii* which have appeared since then and among other described species there have occurred only meager remains of skulls. Lindahl (1893) describes and illustrates an exceptional specimen of *Megalonyx leidyi,* showing for this species the structure of the zygomatic arch, which has been lacking from specimens of *Megalonyx jeffersonii.* Our knowledge of the various species in this genus, therefore, depends principally on the specimens described by Leidy and a scattering of other material found particularly in southeastern and middle western states of North America. Although there have been no complete animals found, by combining the finds from the several localities, almost a complete understanding of the greater part of the skeleton has been furnished.

The present specimen was recovered from the San Pedro horizon of California in May 1938 by John L. Quick, a student in the Geology Department of the University of California at Los Angeles. Located in the city block bounded by Second and Beacon streets, a section of a plateau or mesa exposes both horizons of Lower and Upper San Pedro, covered over by the Palos Verdes Terrestrial. The Upper San Pedro, made up of coarse gravels and sand rich in molluscan fossils with occasional vertebrate remains, is cut through by a wash of Palos Verdes Terrestrial sand, in which, and adjoining the Upper San Pedro horizon, were found the several elements described in this paper. Since the Palos Verdes Terrestrial was laid down in late Pleistocene, apparently these sloth bones may be considered as belonging to that period in Geologic history.

My primary acknowledgment goes to Dr. Loye H. Miller of the University of California at Los Angeles for his continued cheerful guidance and criticism. Then to Dr. Chester Stock of the California Institute of Technology is due acknowledgment of his interest in the specimens and his assistance in obtaining literature concerning *Megalonyx,* also for his offer of John L. Ridgway's services. The plate and line drawing executed by Mr. Ridgway were more than ordinarily appreciated since he completed them just prior to his retirement.

Megalonyx milleri, new species

Locality and Geological horizon.—Locality no. 1063.12, University of California at Los Angeles, from the terrestrial part of the Palos Verdes formation, San Pedro, Los Angeles County, California; late Pleistocene.

Type specimen.—Skull including cranial and facial portions and right zygomatic, distal end of radius, fragment of thoracic vertebra; catalogue no. 8134, Department of Geology, University of California at Los Angeles.

Specific characters.—Distinct slope of supraoccipital region, narrow temporal region.

DESCRIPTION

Skull.—The skull, by no means complete, includes the cranium and facial and occipital regions. The entire dentition, palate and base of the cranium are lacking except for occasional fragments, including part of the basioccipital and one bulla. There are sections of the zygomatic arch in the collection, which, except for a part of the right side, are too incomplete to be reconstructed.

The dorsal profile of the skull taken from a lateral view exhibits a concavity at the forehead and a convexity above the nose as described by Leidy (1855), and the development of a shallow flat sagittal crest. The slope of the supraoccipital bone and the occipital condyles posteriorly from the supraoccipital crest is noticeable, as it reaches an angle of 128.5 degrees with the

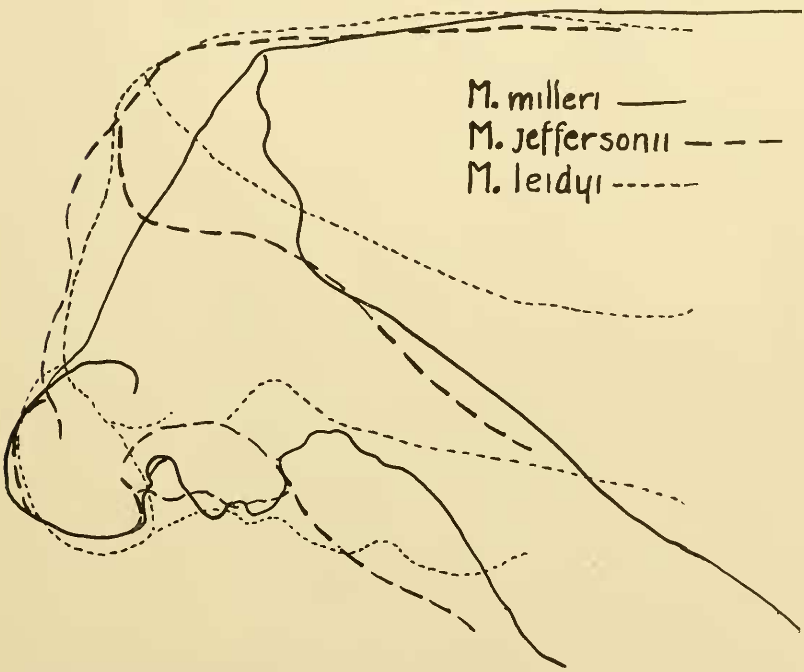

Fig. 1. Diagram comparing the slope of the supraoccipital region in the three species.

plane of the sagittal crest. This differs considerably from that of *Megalonyx jeffersonii* and *Megalonyx leidyi,* in which the angles are very nearly alike, 104 degrees in the former and 108.5 degrees in the latter (see fig. 1). A small crest ascends up the midline of the supraoccipital and joins the superior edge of the foramen magnum with the vertex of the supraoccipital crest. The surface of the supraoccipital bone is rough, covered with depressions and rugosities for muscle attachments.

The supraoccipital crest is rugged over its total length, evidently serving as attachment for the neck muscles along the entire distance. The crest is not high toward the vertex, but displays extensive development laterally to be joined by the growth of the zygomatic process of the temporal bone. The extensive lateral development of the crest in this region results in a greater breadth of the supraoccipital bone than through the region of the paramastoid process. Although the general contour of the supraoccipital bone and crest is similar

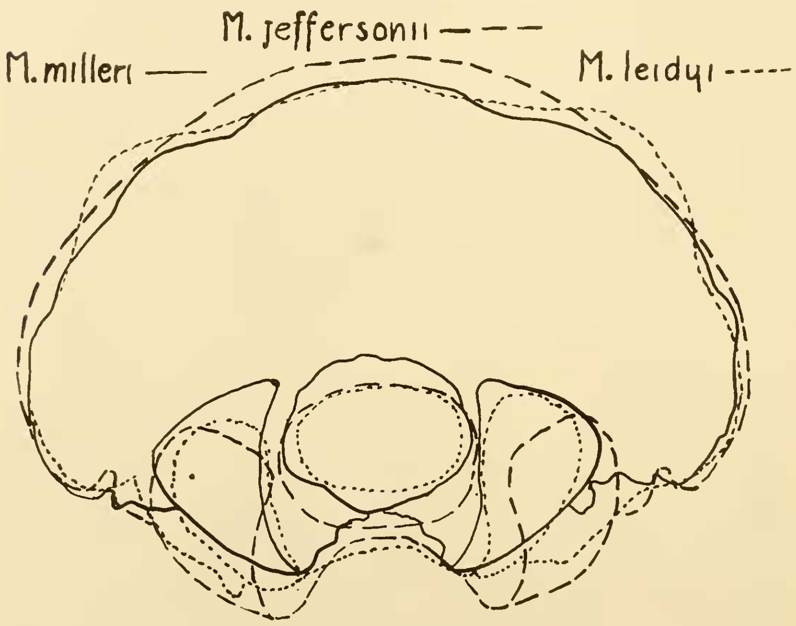

Fig. 2. Diagram comparing the development of the supraoccipital crest in the three species.

to that of *Megalonyx jeffersonii,* it lacks the breadth found more dorsally in *Megalonyx leidyi,* caused in the latter by the higher position of the origin of the zygomatic process on the supraoccipital crest (see figs. 1 and 2). There is no V-formation at the vertex of the crest; it curves evenly toward the midline with no overhang at any point.

The short sagittal crest is low, thick and furrowed with an irregular groove, typical only of the genus *Megalonyx.* At its anterior end it is joined by a distinct, somewhat roughened ridge arising from the postorbital process on each side. The angle formed by the divergence of the temporal ridges agrees more closely with that of *Megalonyx jeffersonii*, 55 degrees in the former and 46 degrees in the latter; *Megalonyx leidyi* has a much less acute angle of 76.5 degrees. Sloping gently downward from the sagittal crest are the sides of the narrow

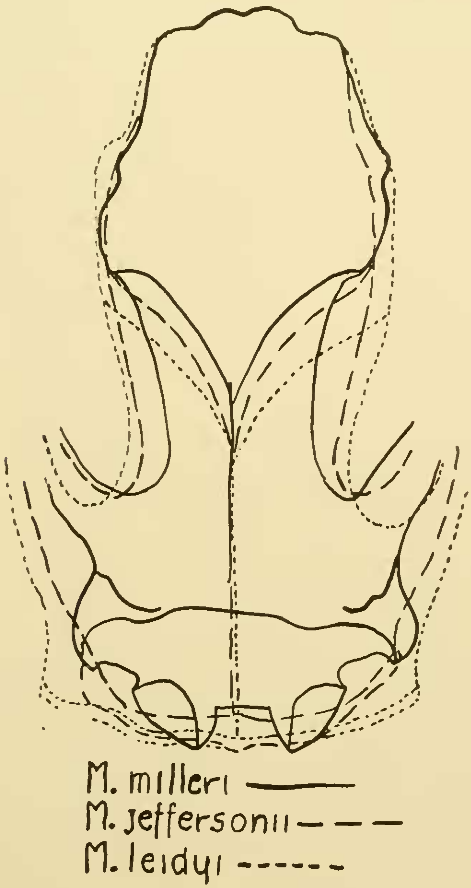

Fig. 3. Diagram comparing the contour of the skull as seen in dorsal view in the three species.

poorly developed cranium, narrower than that of either *Megalonyx jeffersonii* or *Megalonyx leidyi* (see fig. 3). This temporal region, just anterior to the supra-occipital crest is marked with cavities and rugosities for muscle attachments and blood vessels. A noteworthy development of the temporal bone is its zygomatic process directed laterally and ventrally as well as anteriorly. It is broken off near its base on the left side but is more nearly complete on the right.

In the case of the zygomatic arch (fig. 4), enough is present to give a fair concept of its structure, which varies a little from that of *Megalonyx leidyi.* The latter, as illustrated by Lindahl (1893), was used for comparative material because Leidy's *Megalonyx jeffersonii* was without a zygomatic. The zygomatic process of the temporal, projecting forward as described above, is more or less complete for approximately 141 mm. from its origin on the supraoccipital crest, and has a diameter dorso-ventrally of 38 mm. The anterior end of the process, as described for *Megalonyx leidyi* by Lindahl, makes the sudden upward and

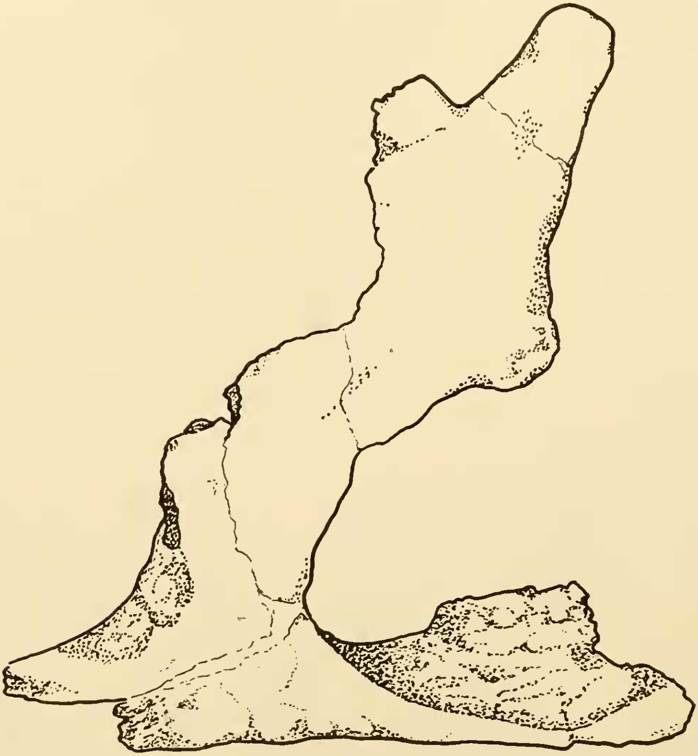

Fig. 4. Zygomatic arch fragment from San Pedro. Lateral view, X 4/5.

posterior turn on its dorsal surface into a well defined process, the dorsal prong, 35.5 mm. long and about 16 mm. in antero-posterior diameter. Almost directly ventral to the dorsal prong is a semicircular roughening on the postero-lateral surface of the zygomatic process as it turns backward into a ventral prong. This rugosity is about 36 mm. long and 11.5 mm. wide at its widest point. Ventral to the rugosity, as mentioned above, extends the root of the ventral prong, described as the free ascending ramus by Lindahl. Since most of the prong is missing, no idea concerning its length can be given. Anterior to this and to the rugosity, the bone begins to thicken and continues into the malar process.

A great part of the malar process is lacking and, since it is well fused with the zygomatic process, it is not evident where the two join. The orbital process, a stout nubbin of bone, arises from the malar 76 mm. from the posterior tip of the dorsal prong. The section of malar bone remaining measures 91 mm. through its greatest length from the rugosity on the zygomatic process. This portion of the bone forms part of the ventral border of the orbit and is 60 mm. ventral to the orbital process, as compared with 50 mm. in *Megalonyx leidyi* (Lindahl, 1893). The angle formed by the ventral malar border of the orbit with the dorsal prong measures 48.5 degrees. A ridge begins on the medial surface of the malar near the region of the rugosity described on the lateral side and pursues a course near the anterior border past the orbital process and along the inner surface of the dorsal prong nearly to its end.

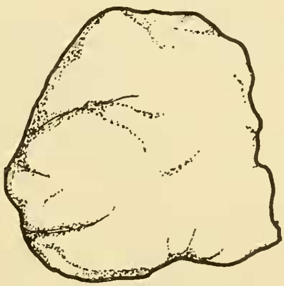

Fig. 5. Bulla from San Pedro. Ventral view, X 1/1.

The paramastoid process curves very slightly anteriorly and is prominent as a continuation of the supraoccipital crest. Just medial to it is the stylohyal process. The external auditory meatus and half of the condyloid foramen are present on each side. The bullae, however, are broken off, one existing as a fragment, triangular in shape, and partially inflated along the medial border (fig. 5). A fragment of the basioccipital includes barely more than the anterior portion of the two insertions for the rectus capitis muscles and an inch and a half of bone anterior to them. The glenoid fossae are flat, with very little curvature and are directed antero-laterally. They are long in that direction in comparison with their narrow width antero-posteriorly.

The foramen magnum is large, wider than high, and bounded laterally by the large outspread condyles. Their surfaces are flat, not curved, which, along with their breadth, results in a strong but less flexible joint than is formed by curved condyles. The articular surfaces are bent transversely in the middle as described by Leidy (1855). The superior halves are directed dorsally, anteriorly and laterally, the inferior halves ventrally, anteriorly and medially.

The incomplete orbits are small, with only parts of the shallow orbital surfaces present in the specimen. The roots of the zygomatic arches are also absent altogether. Both sides possess antorbital and postorbital processes; from the latter ascend the ridges mentioned in connection with the sagittal crest. These ridges slightly overhang and border the temporal fossae.

The nasal region is conspicuous because of the large oval, almost rectangular, nares, rising dorso-medially into a shallow convex bump. The lateral margins of the nares are perpendicular to the floor of the skull; no sutures are indicated, so boundaries of bones cannot be ascertained.

According to such measurements as can be determined and compared with those of Dr. Leidy's *Megalonyx jeffersonii* (table 1), the San Pedro animal is somewhat smaller, as is true also of Stock's *Megalonyx jeffersonii californicus* (1913). The lineal measurements of inches and lines employed by Leidy have

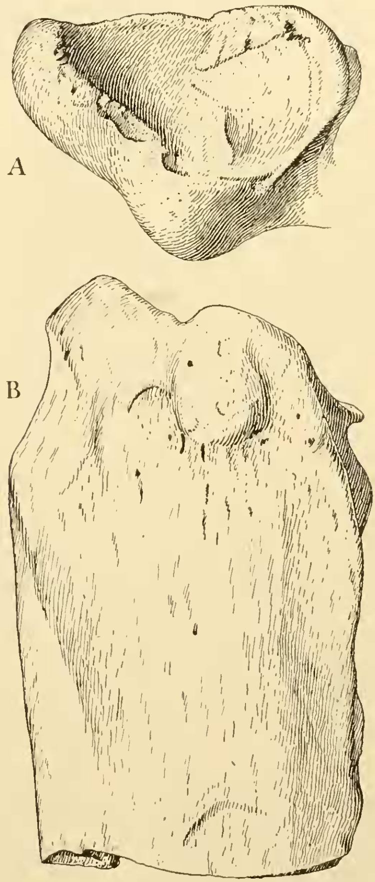

Fig. 6. Radius fragment from San Pedro. Distal (A) and anterior (B) views, X 1/2. Drawn by John L. Ridgway.

been converted into millimeters. Lindahl's figures on *Megalonyx leidyi* also have been included in the table for comparison.

Radius (fig. 6).—The radius material consists of one distal end only, which is convex anteriorly, concave posteriorly and with a maximum length of 153 mm. (6 inches). It presents two articular surfaces, a considerably roughened one for articulation with the ulna, and a smoother concavity for articulation with the carpus. The former is a triangular depression bordered on the posterior margin by a prominent rugosity continuing distally until cut off transversely by a deep groove. A thick ridge of bone separates this groove from the carpal articulation. The opposite border of the radius terminates in a conically protuberant styloid process.

The carpal articulation is a deep triangular concavity slanting distally toward the styloid process. Between the latter and the radial process is a shallow groove for the extensor tendons. As remarked concerning the skull, this specimen proves to be a bit smaller than Leidy's radial elements (table III).

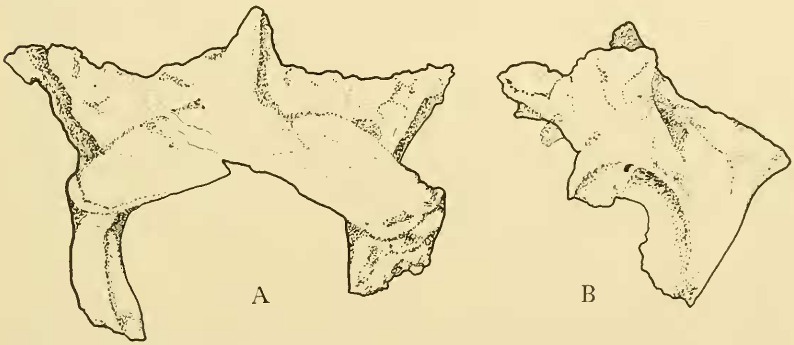

Fig. 7. Thoracic vertebra fragment from San Pedro. Anterior (A) and lateral (B) views, X 2/3.

Posterior Thoracic Vertebra. (fig. 7).—A part of a posterior thoracic vertebra, reconstructed from two fragments of bone, consists principally of a portion of the neural arch and spine. The ends of the transverse processes are missing and most of the neural spine. The bone presents, however, a satisfactory picture of the anterior zygapophyses, which measure across their greatest diameter 88 mm. The greatest internal diameter of the vertebral foramen is 55 mm. Only the dorsal borders and a small fraction of the articular surfaces of the costal facets are present.

Conclusions

Stock (1925) lists seven localities in California from which Pleistocene Megalonychinæ, associated with other forms of ground sloth, have been recovered. Rancho La Brea, the locality nearest San Pedro, has contributed members of this family, including *Megalonyx,* the latter, however, according to Stock, forms a small percentage of the total fauna. The

San Pedro discoveries thus far have consisted of two second phalanges; the Rancho La Brea collection contains no skull, but an assortment of other parts, lower jaw, vertebræ, and leg bones. The elements found there agree with those of *Megalonyx jeffersonii,* apparently varying only in minor details, mostly size, and Stock has called this Rancho La Brea form a subspecies, *Megalonyx jeffersonii californicus.* The above seems to be true only partially for the San Pedro specimen; divergence from *Megalonyx jeffersonii,* also *Megalonyx leidyi,* has consisted of more than mere size and minor details. It may be a member of the same species as the Rancho La Brea specimens, but shows characters too individual to be relegated to a subspecies. It is very possible that the two forms could have existed in close proximity to each other. But the lack of skull material in particular prevents a definite decision concerning their similarity.

Question may arise as to the species *Megalonyx sierrensis,* another form from California, described by Sinclair (1905), but again there is no skull material to check. *Megalonyx sierrensis* might well be a different species due to difference in the terrain it inhabited in the foothills of the Sierra Nevada range. It should be remembered, however, that the exact locale from which the San Pedro specimen may have been washed is not known.

Megalonyx wheatlyi was described by Cope (1899) from poor skull material; but from such details as can be ascertained, the San Pedro skull does not resemble it. For example, the ridge or keel ascending from the foramen magnum to the supraoccipital crest terminates in a definite process on the crest and is more prominent in the former than in the latter.

Certain characters stand out as decidedly different from those of *Megalonyx jeffersonii*: (1) the slope of the supraoccipital bone and (2) the breadth of the temporal region; different from those of *Megalonyx leidyi* are: (1) the slope of the supraoccipital bone, (2) the development of the supraoccipital crest, (3) the position on the supraoccipital crest of the origin of the zygomatic process and (4) the breadth of the temporal region. On the basis of the above considerations, a new species is proposed with the name of *Megalonyx milleri,* in honor of Dr. Loye H. Miller.

TABLE I

SKULL

	Megalonyx leidyi mm.	*Megalonyx jeffersonii* mm.	*Megalonyx milleri* mm.
Length of skull from occipital condyles to anterior margin of first molar alveoli	343	356	*291
Length from inion to anterior margin of nasals	309	311	281
Length of temporal fossa to post orbital protuberance	199	197	167
Depth of temporal fossa in straight line	108	102	93
Length of face from post orbital protuberance	115	119	101
Height of face from most prominent part to middle of hard palate	136	153	?
Breadth of face at post orbital protuberance	123	127	129
Breadth of face at anterior extremity	83	95	98
Breadth of face at sides of first molar alveoli	101	114	*109
Height of face at anterior extremity	101	127	?
Diameter of orifice of nose	77	89	79
Length of face from first to last molar alveolus	150	178	?
Breadth of cranium at narrowest part of temporal region	91	89	75
Length of sagittal crest	144	127	95
Height of inion from inferior margin of occipital foramen	107	110	97
Breadth of inion at paramastoid process	165	159	153

* Measurements only approximate due to absence of alveoli.

TABLE II

Skull

Megalonyx milleri

	mm.
Most posterior point of occipital condyles to most anterior point of nasals	348.0
Supraoccipital crest to anterior point of nasals, medial measurement	277.0
Most inferior point of occipital condyles to most superior point of supra-occipital crest	106.5
Most superior point on supraoccipital crest to superior border of foramen magnum	76.0
Greatest inside height of foramen magnum	34.5
Greatest inside width of foramen magnum	41.0
Greatest width of supraoccipital crest at level of superior border of foramen magnum	161.0
Greatest width of skull at level of paramastoid process	153.0
Greatest width of individual occipital condyle disregarding bend	36.0
Interorbital constriction at narrowest point	125.0
Narrowest width of temporal region	76.0
Narrowest width of zygomatic process anterior to losing its identity in temporal bone	43.0
Greatest width through nasals	102.0
Skull width through most lateral borders of glenoid fossæ	180.5
Skull width through external auditory meatus	141.5
Superior border of foramen magnum to most anterior median point of nasals	318.5
Glenoid fossa, greatest width antero-posteriorly	27.0
Glenoid fossa, greatest width medio-laterally	65.0
Most posterior limit of paramastoid to most posterior limit of glenoid fossa	63.0

TABLE III

Radius

	Megalonyx jeffersonii		*Megalonyx milleri*
	No. 1 mm.	No. 2 mm.	mm.
Greatest breadth at distal end	94	107	96
Breadth carpal articulation		82	72
Greatest antero-posterior diameter of carpal articulation		59	51

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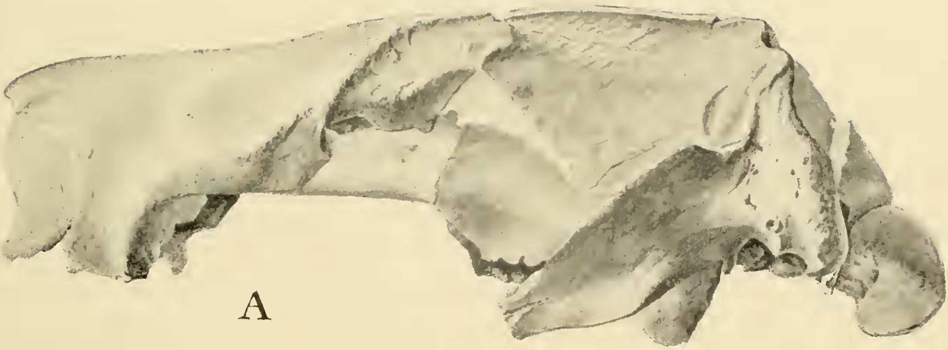
EXPLANATION OF PLATE

Skull of *Megalonyx milleri* from San Pedro, California
Lateral (A) and dorsal (B) views, X 3/8.

Drawn by John L. Ridgway



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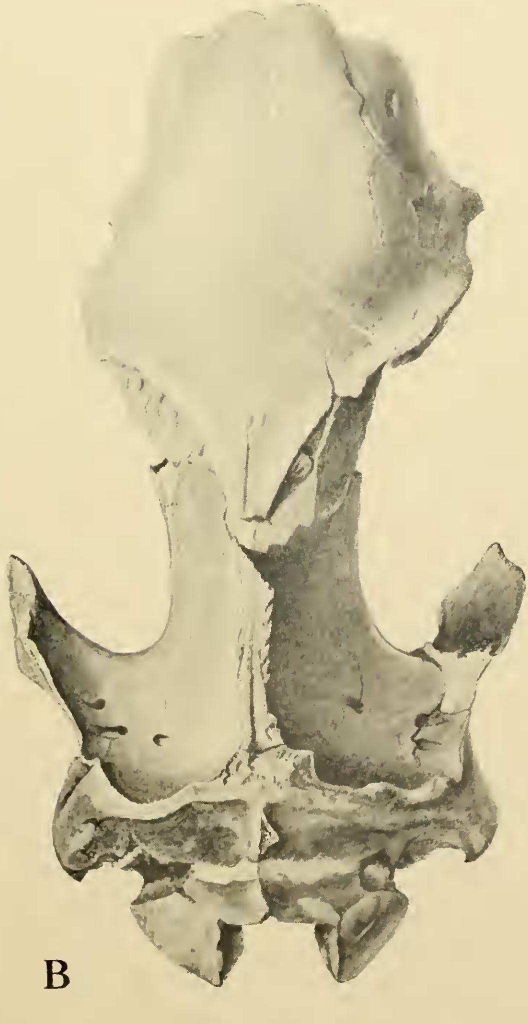

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